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Research Article Awareness of Folic Acid Intake for Prevention of Neural Tube Defects among Women in Sakaka, Saudi Arabia

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Abstract

Background and Objectives: Folic Acid (FA) supplementation reduces the risk of Neural Tube Defects (NTDs). This study aimed to determine the awareness of FA's ability to prevent NTDs among women of childbearing age in the Aljouf region of Saudi Arabia. **Materials and Methods:** From May-July, 2017 in Sakaka, Saudi Arabia, a sample of 400 non-pregnant women aged 19-45 years old completed surveys on FA and its impact before and during pregnancy. **Results:** In total, 89.3% of the women had heard of FA, 74.8% knew that FA could prevent NTDs, 81.5% had used FA previously, 50.3% were currently taking FA and 3.3% had experienced miscarriages and given birth to children with NTDs. Only 5.5% of the subjects reported knowing that FA should be taken prior to and during the first trimester of pregnancy. Participants aged 26-35 years old had significantly greater FA awareness and knowledge compared to the other age groups. The data revealed a significant positive correlation between education level and FA awareness and knowledge. Women with lower gravidity had significantly less FA awareness and knowledge. Women who planned to become pregnant were significantly more likely to be taking FA supplements. **Conclusion:** Healthcare professionals, public health officials and the media need to increase efforts to spread awareness of the importance and timing of FA supplementation toward reducing the risk of NTDs.

Key words: Folic acid, neural tube defect, pregnant women, FA awareness, miscarriages

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Competing Interest: The author has declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Folic Acid (FA) is a member of the vitamin B family and comprises the "core" portion of a range of molecules collectively referred to as folate1. The FA is one of the "essential" vitamins that can only be obtained through diet, rather than being synthesized de novo. It is required for DNA replication, amino acid biosynthesis and many other enzymatic reactions. Thus, demand for FA increases dramatically during pregnancy to support the growth of the developing fetus². Insufficient FA before and during pregnancy are associated with Neural Tube Defects (NTDs), congenital heart defects, preterm birth and other complications. International guidelines recommend that women of reproductive age ingest at least 400 µg/day of FA, which is usually achieved through supplementation³. Furthermore, in many countries, the food supply is fortified with FA to ensure pregnant women receive sufficient amounts of this critical vitamin⁴.

Congenital abnormalities, including NTDs are a major physical, psychological and public health challenges⁵. The NTDs result from aberrant neural tube development that can affect the spinal cord and the brain. They are associated with fetal and infant mortality, morbidity, psychological maladjustment, severe lifelong disability and staggering economic costs⁶. The most common of these birth defects worldwide are spina bifida and anencephaly. These occur due to a failure in the closure of the neural tube, leaving the spinal cord unprotected by its usual bony cover and, thus, open to infection and physical trauma¹. Approximately one to two of every 1,000 pregnancies are affected with NTDs and either ended following prenatal screening and diagnosis or result in the birth of persons with fatal abnormalities¹. Globally, over 260,000 pregnancies are affected by NTDs and 75% result in under-5 deaths⁶. In the countries with FA protection policies, NTDs are less common, with fewer than 10 cases per 10,000 births reported⁷.

Daily FA supplementation is essential for women who are planning to or capable of becoming pregnant, as recommended by the United States' Preventative Services Task Force⁸. The benefits of FA during pregnancy include reduced risk of low birth weight, autism, language delay, developmental abnormalities and other congenital defects^{9,10}. The fortification of staple foods with FA prevents approximately 375,000 of these birth defects every year¹¹. More specifically, FA has been credited with decreasing the prevalence of spina bifida by 31% and anencephaly¹² by 16%.

A study by Kari *et al.*¹³ explored the awareness level among female college students of FA intake before gestation

and its ability to prevent NTDs. A study from the Hail region of Saudi Arabia found that 91.0% of the respondents were aware of FA, 81.0% knew that FA could prevent NTDs and 84.0% took FA prior to or during pregnancy¹⁴. A study performed on a clinic-based pregnant population in Saudi Arabia showed that 22% started FA supplementation before conception and 50% of the women could provide the correct reason for taking FA¹⁵. The FA intake remains low in females of childbearing age due to a lack of awareness of the role of FA in preventing the risk of NTDs. Furthermore, the time between planning a pregnancy and the actual pregnancy can be unpredictable, which increases the likelihood of overlooking a daily dose of FA¹⁶. Kim et al.¹⁴ found that 9.4% of women took FA supplements and the women who had never before conceived were less aware of FA intake requirements. Therefore, this study aimed to evaluate the awareness, knowledge and use of FA among non-pregnant women of reproductive age.

MATERIALS AND METHODS

Study design and participants: A questionnaire was completed by women aged 19-45 years from May-July, 2017. Employees, unemployees and students in Sakaka city were recruited for the survey. The study was approved by the institutional review boards of clinics and the researcher's Jouf University.

Questionnaire: A self-administered questionnaire was developed based on previous studies. It included information on demographic characteristics such as age, education, employment status, gravidity and planned pregnancy. In terms of FA awareness, the respondents were asked if they had heard of FA, knew that FA prevented NTDs had ever taken FA supplements and had a history of miscarriages and births with NTDs. The survey also included questions on the timing of FA supplementation and on where they obtained information on FA.

Definition of awareness and knowledge of FA: The FA awareness was defined as having heard of FA. Knowledge of FA was defined as knowing that FA prevents birth defects, having had taken FA supplements, the number of miscarriages and births with NTDs, knowing the correct timing for FA supplementation and the source of information about FA.

Statistical analyses: After excluding incomplete responses, the data were analyzed using the Statistical Package for Social Sciences (SPSS version 22.0; COMPANY NAME, CITY, STATE,

USA). Frequencies and percentages were calculated for the qualitative data. A chi-squared test was performed to determine differences in the proportions of the categorical variables. Age, education, employment status, gravidity and planned pregnancy were added to the model as the independent factors; awareness and knowledge served as the dependent variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 showed the demographic characteristics of the participants. In total, 400 women were included in this study, 48.5% were 26-35 years old and 29.3% were 36-45 years old. The percentage of women with a university education was 61.5%. Nearly half of the women were employed (48.3%). 46.8% of the participants had 3-5 children and 51.3% of women anticipated future pregnancies.

The awareness and knowledge of FA were shown in Table 2. Approximately 89.3% of the respondents had heard of FA, 74.8% knew that FA prevent NTDs and 81.5% had previously taken FA supplements. Half of the women (50.3%) were currently taking FA supplements. The percentage of miscarriages and births with NTDs was 3.3%. The main sources of information on FA were from a doctor (60.8%), the media (14.3%) and family members (13.3). The proportion of women taking FA supplements during the first three months of pregnancy was 69.6%, before pregnancy was 24.9% and during and before pregnancy was 5.5%.

Table 3 contained the distribution of awareness and knowledge factors based on selected demographic characteristics. Among women aged 26-35 years, 96.4% had heard of FA, 83.5% had knowledge of NTD-prevention, 90.2% took supplements, 56.7% currently use FA supplements and 2.06% had a history of miscarriages and births with NTDs. This age group scored significantly higher in FA awareness and knowledge compared to the other age groups. Level of education (university education) was significantly positively correlated to awareness and knowledge of FA. Knowledge of the importance of FA intake for the prevention of NTD was correlated with gravidity. Current supplementation status was significantly higher in women with fewer children (up to two) compared to women with three or more children (p<0.05). A significantly higher proportion of employed women were aware and had knowledge of FA relative to unemployed women (p<0.05). Women who planned to become pregnant were significantly more likely to have heard of FA, to be currently taking FA supplements and to have a history of miscarriages and births with NTDs.

Table 1: General	characteristics	of the study	partici	pants $(N = 400)$	
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Total	Number	Percentage		
Age				
>25	89	22.3		
26-35	194	48.5		
36-45	117	29.3		
Education level				
Less than high	41	10.3		
High school	113	28.3		
University education	246	61.5		
Employment				
Employed	193	48.3		
Un-employed	138	34.5		
Student	69	17.3		
Gravidity				
0-2	99	24.8		
3-5	187	46.8		
<5	114	28.5		
Planned pregnancy				
Yes	205	51.3		
No	195	48.8		

Table 2: Awareness and knowledge of folic acid among women in the childbearing age in Sakaka city-SA

Total	Number	Percentage
Heard about FA		
Yes	357	89.3
No	43	10.8
Head about FA prevents neural tube defects		
Yes	299	74.8
No	101	25.3
Ever taken folic acid supplements		
Yes	326	81.5
No	74	18.5
Currently under folic acid supplementation		
Yes	201	50.3
No	199	49.8
Miscarriages and births of neural tube defects		
Yes	13	3.3
No	387	96.8
Sources of information about folic acid		
Doctor	243	60.8
Nurse pharmacies	30	7.5
Media	57	14.3
Family	53	13.3
Others	17	4.3
Timing of folic acid for prevent NTDs		
3 months before pregnancy	151	69.6
3 months before pregnancy and in first trimester	12	5.5
Before pregnancy	54	24.9

DISCUSSION

In the present study, 89.3% of participants were aware of FA. These results are strikingly similar to a study from Taipei, Taiwan that found nearly 90% of pregnant women had heard about FA⁵. Previous studies on women of childbearing age in Saudi Arabia have reported awareness rates of 91.8, 93.1 and 58% from Jeddah, Tabouk,¹⁷ and Riyadh¹⁸, respectively.

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Table 3: Awareness and knowledge of folic acid among women in the childbearing age in Sakaka city-SA in relation to age, education, employment, gravidity and planning for pregnancy

Parameters	- <u>-</u>	Heard about FA		Heard FA prevents NTDs		Ever taken FA supplements		Currently under FA supplementation		Miscarriages and births of NTDs	
	No.	No.	%	No.	%	No.	%	No.	%	No.	%
Total	400	357	89.3	299	74.8	326	81.5	201	50.3	13	3.25
Age											
>25	89	71	79.8	60	67.4	61	68.5	47	52.8	0	0
26-35	194	187	96.4	162	83.5	175	90.2	110	56.7	4	2.06
36-45	117	99	84.6	77	65.8	90	76.9	44	37.6	9	7.69
p-value		0.000**		0.000**		0.050		0.000**		0.166	
Education											
Less than high	41	30	73.2	20	48.8	25	61	18	43.9	5	12.2
High school	113	90	79.6	61	54	85	75.2	56	49.6	5	4.42
University education	246	237	96.3	218	88.6	216	87.8	127	51.6	3	1.22
Chi-square		0.000**		0.000**		0.000**		0.000**		0.735	
Employment											
Employed	193	191	99	170	88.1	173	89.6	104	53.9	5	2.59
Un-employed	138	116	84.1	84	60.9	107	77.5	61	44.2	8	5.8
Student	69	50	72.5	45	65.2	46	66.7	36	52.2	0	0
Chi-square		0.000**		0.000**		0.000**		0.000**		0.405	
Gravidity											
0-2	99	84	84.8	73	73.7	71	71.7	52	52.5	1	1.01
3-5	187	179	95.7	153	81.8	165	88.2	106	56.7	1	0.53
<5	114	94	82.5	73	64	90	78.9	43	37.7	11	9.65
Chi-square		0.000**		0.000**		0.000**		0.000**		0.000**	
Planned pregnancy											
Yes	205	182	88.8	165	80.5	173	84.4	118	57.6	4	1.95
No	195	175	89.7	134	68.7	153	78.5	83	42.6	9	4.62
Chi-square		0.711		0.073		0.268		0.014*		0.166	

*Significantly different at p<0.05, **Significant different at p<0.01 by chi-square test

Providing FA through fortified food or peri-conceptional supplementation reduces the occurrence of NTDs¹⁹. The NTDs result from vitamin deficiency and can be prevented through suitable correction prior to and during pregnancy²⁰. The majority of women (74.8%) surveyed in this study knew that FA deficiency leads to NTDs. This is higher than previous reports from Saudi Arabia of 49.5% in Tabouk¹⁸ and 71.2% in Makkah Al-Mokarramah²¹. In the same context, another study showed higher results most of the participants (81.0%) knew that FA deficiency during pregnancy leads to NTD¹⁰. These differences in awareness level could be due to the study subjects in different cities in Saudi Arabia.

In the current study, 81.5% of the participants had previously taken FA supplements. Another study performed in Saudi Arabia showed lower results of only 63% of women with a history of using FA during their previous pregnancies¹⁵. Proper timing of FA supplementation is very important toward preventing NTDs. In the present study, 5.5% of participants reported that the timing of FA for effective prevention of NTDs was three months before pregnancy and in the first trimester, 69.6% answered three months before pregnancy, 24.9% answered during pregnancy. A similar study in Tabouk showed that only 10% of respondents knew that FA should be taken before pregnancy¹⁷ and in contrast, another found that 72.7% knew the proper timing of FA intake (before and during the first trimester of pregnancy)²¹. Approximately 57% of women in Al Qassim took FA during the first trimester²². Only 10% of women knew that FA should be taken as early as 12 weeks prior to conception in Hail, Saudi Arabia¹⁰ compared to 24.7% in Lebanon²³.

In present study, the most common sources of information on FA were from a doctor (60.8%), the media (14.3%), a family member (13.3%) or nurse pharmacies (7.5%). A previous study showed that the most common sources were doctors (49.5%), followed by family members (24.8%)¹⁷. The most commonly reported sources of information on FA were from a healthcare service (70.3%), the internet (7%), the radio and TV (2%) and nurses and midwives (0.4%)²². These data highlighted the heavy burden placed on doctors to advise all women of childbearing age to take FA supplements when they are planning to conceive. At this point, they also need to explain basic nutritional information with an emphasis on the role of FA in preventing NTDs and other complications²². Reduced folate levels in the blood and plasma of pregnant women have been causally related to NTDs and the risk of having an affected child is inversely proportional to this concentration during early pregnancy. The current study found that younger mothers (25-35 years old) had greater FA awareness and knowledge compared to the other age groups (<25 and 36-45 years). These results are in line with those from Alsammani *et al.*²⁴ who postulated that because women in this age group are just starting their generative lives, they are more receptive to information about FA compared to older mothers. McWalter *et al.*¹⁵ found that age was a significant determinant of whether or not FA was used during pregnancy in Riyadh, Saudi Arabia.

Level of education (university educated) was significantly positively correlated with awareness and knowledge of FA. The university-educated women were significantly (p<0.05) more likely to supplement their diet with FA. This finding is agreement with numerous previous studies that found that women with higher education levels knew more about FA and had higher rates of use^{25,18} in Riyadh, Saudi Arabia²⁶. Women with higher education level knew more FA and its use in the pre-conceptional period²⁷.

Another study found that in rural areas, women with less education knew less about FA and when to use it²⁸. Poor knowledge of FA's benefit significantly correlated with poor educational level²⁹. On the other hand, some studies haven't demonstrated any correlation between sociodemographic characteristics and FA awareness and use³⁰. In a study from CITY, there was no observable relationship between the level of education or occupation and the use of FA supplements³¹. Furthermore, a high percentage of educated women in Jeddah, Saudi Arabia were not aware of FA's ability to prevent NTDs¹³. The results from this study describe relatively low rates of miscarriages and births with NTDs, likely because the majority of study subjects reported taking FA supplements (81.5%). These results are consistent with those published by Al-Hakeem¹⁸.

CONCLUSION

The present study revealed that a majority of women were unaware of the proper timing of FA supplementation. A higher level of education and lower number of births correlated significantly with greater knowledge and accurate timing of FA supplementation. Overall, the results of this study indicate that women of reproductive age should be better informed regarding the benefits of FA supplementation prior to and during pregnancy.

SIGNIFICANCE STATEMENT

This study discover the decrease in awareness of FA's ability to prevent NTDs among women of childbearing age in

Sakaka city and presence of children those have NTDs, that can be beneficial for importance of folic acid intake for reducing NTDs. This study will help the researcher to uncover the critical areas of benefits of folic acid that many researchers were not able to explore. Thus a new theory on use folic acid to prevent NTDs may be arrived at.

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